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A report on field visit to Soan's Farm, Moodbidri.

Field visit location: Soans Farm is located about 40 km from Mangalore in Moodbidri on National Highway 13. It has developed over years as a center for innovative agriculture. This 100 acres of farm land by the side of Karkala - Udupi State highway is now a sanctuary for exotic fruit and flower bearing trees. Traditional agriculture in this area was restricted to the valleys with perennial water supply for crops like Arecanut, Coconut, Banana and Rice. An attempt was made in 1926 to bring into useful cultivation of many varieties of crops and fruit plants on hilly areas and non-forested grasslands.

About crops:

The commercially grown crop plants in the Soan's Farm are Pineapple, Coconut, Pepper, Mango, Guava, Nutmeg, Cinnamon, Cardamom, Nutmeg, Mace, Vanilla, Banana, Rambutan, Mangosteen, Durian, Barbados cherry, Surinam cherry, Passion fruit, Cocoa, Bamboo, jack fruit, Rangoon cherry, Star apple, Star fruit, and Rose apple, Custard apple, Egg fruit, Mulberry, Allspice, Clove, Cashew, Breadfruit, Butter fruit, Gooseberry, Yam, Arecanut, Coffee and different varieties of ornamental and fruit plants.

In this field visit we also could gather information on several medicinal plants. We could observe 40 varieties of Bamboo grown in the area. Soan's Farm nurtures bamboo from all over the world and attracts many plant lovers to visit and study varieties of bamboo in one single place. Buddha's belly bamboo (Bambusa vamin) grown as ornamental plant and also used in handicrafts. The young shoots of 'Sweet bamboo' (Dendrocalamus asper) are used as vegetable. Thornless giant Burma bamboo (Dendrocalamus

Teacher's Signature :

gigantens) is the tallest one in the farm that grows up to 35 mts.
The following is the list of plants with their taxonomic names. This chart ~~gives the d~~ depicts the diversity of Soan's Farm.

* click the link sent and with the chart.

~~Result~~ Highlights of the field visit :- We, the students of botany could observe ~~buy~~ many representative species of plants including allspices, beverages and medicinal plants in the Soan's Farm. This fieldvisit gave us the exposure for observing varieties of bamboos especially.

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Class: Dicotyledoneae

Sub class: Monochlamydeae [Perianth uniseriate, not differentiated into calyx and corolla.

Series: Unisexuales [Presence of unisexual flowers]

Family: Euphorbiaceae

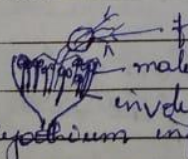
Examples: Euphorbia hirta, E. tirucalli, Jatropha curcas (Diesel plant), Hevea brasiliensis (Rubber tree), Phyllanthus emblica (Aon), Ricinus communis (castor), Acalypha hispida

Habit: Herbs (E. hirta), Shrubs (Jatropha), tree (Hevea)

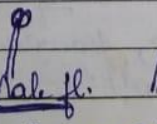
Leaves: Simple, opposite or alternate, stipules often present sometimes replaced by glandular hairs or thorns.

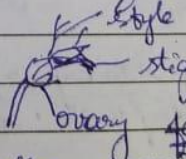
Infl: Cyathium in Euphorbia. Cymose in Jatropha, Phyllanthus, Racemose in Ricinus, Croton sp.

Cyathium: It is the characteristic inflorescence of the family Euphorbiaceae. It is a highly condensed inflorescence looking like a flower. Cyathium consists of a highly reduced, solitary, central female flower surrounded by five scorpioid cymes of reduced male flowers. Flowers are enclosed within a cup shaped involucre formed by the union of five bracts. Female flower is reduced to gynoecium with ovary, style and stigma. There is only one female flower surrounded by numerous male flowers. Each male flower is reduced to a stamen. The involucre is often provided with nectar glands on its surface.



Cyathium inflorescence.





Flower: Small, bracteate, actinomorphic, unisexual, hypogynous. monochlamydeous.

Perianth: Uniseriate (Phyllanthus), In Euphorbia, perianth is lacking.

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Androecium : Stamens represent male flowers. Stamens usually as many as or twice as many as perianth lobes or reduced to one. Filaments are free or united into a column.
Gynoecium : Female flower itself is the gynoecium. Ovary superior, tricarpellary syncarpous, ovules 1-2 in each locule, pendulous on axile placenta. Styles 3. Each style is bifid. Stigmas six.
Fruit : Mostly capsule or regma (in Ricinus)

Class : Dicotyledoneae
S-cl : Monochlamydeae
Series : Unisexuales (presence of unisexual flowers)
Family : Moraceae.
Example : Ficus religiosa (♂♀), F. benghalensis (Banyan) F. racemosa (♂♀), F. elastica (rubber fig tree), Artocarpus heterophyllus (Jack), Morus australis (Mulberry).
Habit : Mostly trees with milky latex.
Leaves : Simple, alternate, very rarely opposite, stipulate, stipules are large and may envelope the bud. Stipule fall off at the time of its unfolding, leaving a circular scar.
Inflorescence : Cymose. But often much modified.
i) Hypanthodium : In Ficus sp. the inflorescence is hypanthodium. Here the receptacle is hollow, cup shaped with an opening guarded by scales. It is formed by the condensation of rachis of three closely placed cymes. Inner wall of the receptacle is lined by numerous, minute, unisexual flowers. Flowers are of three types - Male, female and gall flowers. The male flowers are situated near the opening of the receptacle. Female and gall flowers are present on the sides and on the floor of the receptacle.

Hypanthodium
V.S. of hypanthodium.

Catkin : In Artocarpus, flowers are crowded on globose, oblong or cylindrical receptacle. Catkin is a pendulous spike with unisexual flowers.
Flower : Small, inconspicuous, actinomorphic, unisexual, hypogynous
Perianth : Tepals usually 4, of 4 in 2 whorls free or united. (Sometimes reduced or absent).
Androecium : Stamens usually equal to number of tepals and opposite to them. In Ficus, stamens 1-6.

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Gynoecium: Ovary superior, carpels 2, one often do not develop, usually unilocular with solitary pendulous ovule. Styles one or two, filiform.
Fruit: Basically a drupe or achene.
In Artocarpus, fruit is Sorosis. All the floral parts of an catkin inflorescence fused together to form a multiple fruit. The flowers are arranged on the thick rachis. Apices of the carpels fuse together to form a tough spinous rind. The edible part is fleshy perianth.
In Ficus, hypanthodium inflorescence develops into a multiple fruit called syconus. The edible part is a fleshy receptacle which encloses individual fruits called achenes.
Class: Dicotyledoneae
S.Cl: Monochlamydeae
Series: Curvembryae (curved embryo, ovule on basal placenta, superior ovary).
F: Amaranthaceae
Ex) Amaranthus tricolor, A. spinosus, Alternanthera sessilis, Achyranthes aspera, Celosia argentia, Gomphrena globosa (Creeping)
Habit: Mostly herbs.
Leaves: Simple, alternate, exstipulate.
Inflorescence: Terminal or axillary spike.
Flower: sessile, bracteate, bracteolate (both are prominent), scarcous, bisexual (In Amaranthus - Unisexual (practicals)), actinomorphic, monochlamydeous, pentamerous, hypogynous.
Perianth: Tepals 5, free, persistent, scarcous, imbricate.
Androecium: In Amaranthus, stamens 5, free in male flowers, opposite to tepals. Anthers dithecous, dorsifixed, longitudinal dehiscence.
Gynoecium: Ovary superior, tricarpellary syncarpous, unilocular, ovules few, placentation basal, style single, terminal, stigma minutely bifid. In Amaranthus bicarpellary syncarpous, unilocular with a single ovule on basal placenta.
Fruit: An utricle.

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Class Monocotyledoneae (Presence of single cotyledon, fibrous and adventitious root system, parallel venation in leaves, flowers mostly trimerous)

Series Microspermae (Presence of petalloid perianth, ovary inferior, tricarpellary unilocular with parietal placentation or rarely trilocular with axile placenta, seeds minute, numerous without endosperm)

Family: Orchidaceae (Members are commonly called as orchids)

Ex: Vanilla planifolia (Land orchid), Bulbophyllum, Dendrobium ovatum, Vanda, Acanthe (epiphytic orchids).

Epiphytic orchids are autotrophic and they posses three kinds of roots.

a) Climbing roots: these roots help in fixing the plant to the support.

b) Absorbing roots: They absorb some food from the humus collected in between clinging roots.

c) Aerial/epiphytic roots: These are special moisture absorbing roots consisting of velamen tissue which hang freely in the air.

Leaves: Simple, alternate, often distichous, parallel venation, sheathing leaf base is present in some orchids.

Inflorescence: Raceme

Flower: Showy, bracteate, zygomorphic, usually bisexual, epigynous, trimerous.

Resupination: In the initial stage of development, flowers remain normal as far as the position of the floral parts to the axis is concerned. But during development, there occurs torsion. That is twisting of the ovary through 180° and is known as resupination. As a result, anterior parts of the flower are brought to the posterior position and viceversa with reference to its axis.

Perianth: 6 tepals in two whorls. Free or variously combined. Tepals of inner whorl are unequal. Two tepals of inner whorl (anterior side) are petalloid, while the posterior one is variously modified in colour, shape and size and is known as labellum or lip. Labellum serves the purpose of attraction and acts as landing place for insects. After resupination, the labellum occupies anterior position, aestivation imbricate. Lateral tepals of inner whorl are free.

One tepal of outer whorl is free (posterior). Two lateral tepals of the outer whorl are adnate to the foot of the column to form a mentum. Labellum is attached to the foot of the column.

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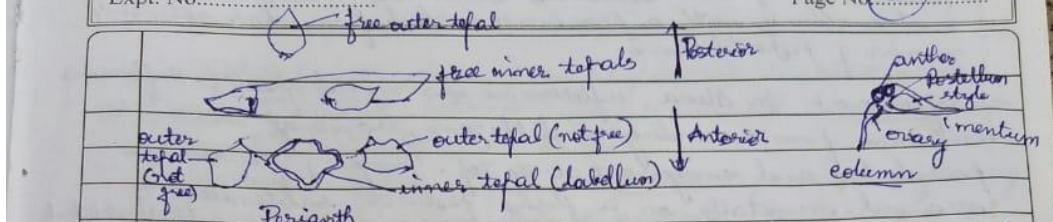


column: Essential organs are arranged in a central structure called column. It consists of a stamen, stigmas and styles. Outer lateral two tepals are attached to column to form mentum. column consists of inferior ovary, anther, two styles, rostellum and mentum.

Androecium: There is only one fertile stamen. ~~anther~~ dithecous, opening by longitudinal slit, pollen grains are into 1-4 pollinea. Pollinea in an anther lies in a small depression on the column called rostellum which occupies almost the centre of the column.

Gynoecium:- Ovary inferior, tricarpellary syncarpous unilocular with ovules in parietal placentation. Styles 3, 2 fertile, ~~the~~ one is sterile & is represented by a depression called rostellum.

Fruit: A capsule.

Class: Monocotyledoneae

Series: Epigynae (Inner perianth petaloid, ovary inferior, endosperm more)

Family: Musaceae

Ex: Musa x paradisiaca (Banana) (It is a triploid hybrid obtained from crossing Musa acuminata and Musa balbisiana.

Musa superba (Ensete superbum) - wild banana.

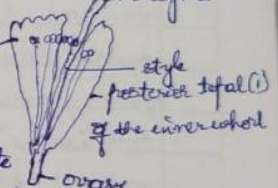
Habit: Plants mostly perennial herbs perennating by means of an underground rhizome. Rhizome produces new aerial stems. The 'aerial erect stem' is 'pseudostem' which is formed by the overlapping of the leaf bases. It is cylindrical. The pseudostem is unbranched and is juicy with a watery sap.

Teacher's signature :

Leaves:- very large with prominent sheathing leaf bases. Petiole is long and ~~channel~~ channelled. Lamina is broad, oval or oblong with a prominent midrib from which extend a number of parallel veins.

Inflorescence:- In Musa inflorescence is a mixed spadix. Inflorescence axis arises from the underground rhizome, travels up within the pseudostem and emerges out at the top. Groups of flowers are arranged acropetally on a fleshy peduncle subtended by spathaceous bright bracts. The female flowers are mostly restricted to the base of the inflorescence, male at the top and bisexual flowers inbetween. When the flowers open, the bracts roll back & fall off.

Flower:- Sessile, zygomorphic, bisexual, or unisexual, trimerous, epigynous



Perianth:- Tepals 6, in two whorls, free or united, perianth lobes are usually petaloid. In Musa, posterior tepal of inner whorl is free and it is short and broad. Remaining 5 tepals connate to form a large structure which bears 5 teeth at its tip.

Aestivation imbricate.

Androecium:- stamens 6, free in two whorls. 5 stamens are usually perfect while the 6th one is either absent or rudimentary.

Gynoecium:- Ovary inferior, tricarpellary syncarpous with numerous ovule in each locule on axile placentation, style filiform terminating in a capitate or bilobed stigma.

Fruit:- A long berry.

Class: Monocotyledoneae

Series: Epigynae (inner perianth petalloid, ovary inferior, endosperm copious.

Family: Zingiberaceae.

Example: Curcuma longa (turmeric), Zingiber officinalis (ginger), Elettaria cardamomum (cardamom), Hedychium coronarium (butterfly lily)

Habit:- Perennial herbs, most of them are aromatic. Plants have creeping tuberous rhizome having thick or slender roots.

Stem:- Usually an underground rhizome, plants may or may not possess aerial stem.

Leaves:- radical (directly from rhizome) or cauline (from aerial stem), simple, leafbase sheathing, lamina linear, elliptic or

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lanceolate with closely parallel pinnate venation. One ligule is present between the petiole and lamina. Leaves alternate, distichous or spiral.

Inflorescence: Raceme, spike (Hedychium) or panicle - infl. may be present on leafy aerial shoots or on scapes. (Scape is leafy or leafless arising from the rhizome).

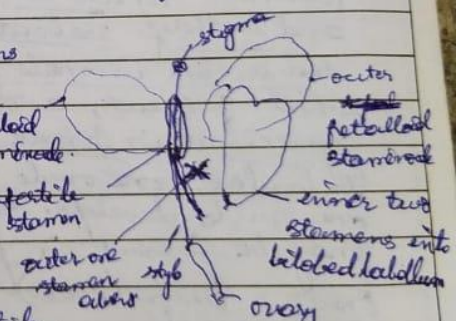
Flower: Bisexual, zygomorphic, epigynous, bract and bractoles are often coloured and arranged spirally.

Perianth: It consists of six tepals in two whorls of three each but distinguishable into calyx and corolla.

Calyx: Sepals 3, united to form a tube. Aestivation valvate.

Corolla: Petals 3, gamopetalous, ~~posterior petal is usually largest and outer~~ imbricate

Androecium: Theoritically there are six stamens arranged in two whorls of three each. But only one is fertile, ~~rest~~ outer whorl: two stamens are modified into petaloid staminodes, while one is suppressed (absent). Inner whorl: one posterior stamen is fertile, lateral pair united to form a bilobed labellum and forms the most conspicuous part in the flower. Filament of the fertile stamen is slender and deeply grooved. anther dithecous.

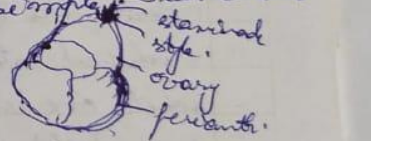


Gynoecium: Ovary inferior, tricarpellary syncarpous, trilocular with axile placentation or uniloculer with parietal placentation. Ovules many, slender style passes through the groove of the stamen. Stigma projects beyond the anther.

Fruit: capsule.

Class : Monocotyledoneae
Series: calycinae (perianth not petalloid, not differentiated into calyx and corolla).
Family : Araceae / Palmae
Examples: Cocos nucifera (coconut palm), Areca catechu (Areca palm), Borassus flagellifer (Palmyra palm), Phoenix dactylifera (Date palm).
Habit: Mostly trees. Stem erect, tall, unbranched, woody.
Leaves: Very large, alternate, spiral, pinnately compound, leaf base sheathing, leaflets linear with stout midrib, venation pinnately parallel, exstipulate.
Inflorescence: Compound spadix with woody boat shaped spathe. A large number of independent axis are present in the inflorescence representing independent units called spikelets. Each spikelet usually bears only one female flower. A little distance away from the base and just above the female flower, male flowers are present.

Flower: Sessile, ebracteate, ebracteolate, unisexual, monoecious, trimerous, ♂ flowers hypogynous.
Perianth: Tepals six, free, in two whorls of 3 each. Tepals stiff and leathery. Valvate in male, imbricate in female flower.
Androecium in male flower: stamens 6, free, arranged in two whorls of 3 each, anthers versatile. Dehiscence longitudinal.
Gynoecium in female flower: Ovary superior, tricarpellary, syncarpous, trilocular, one ovule in each locule on axile placenta. But only one ovule develops. styles 3, short, stigma simple. Staminode may be present in female flower



Fruit: Drupe (cocos) Berry (Phoenix).

Class: Monocotyledoneae.
Series: Glumaceae (inflorescence unit is spikelet, bracteate, bracteolate, glumaceous)
Family: Poaceae / Gramineae
Examples: Oryza sativa (paddy), Zea mays (maize), Triticum aestivum (wheat) Saccharum officinarum (sugarcane).
Habit: Herbs.
Stem: Cylindrical, sometimes hollow with distinct nodes & internodes.
Leaves: Simple, alternate, distichous, sessile with sheathing leaf base which is split open on the side opposite to the leaf blade. There is hairy structure at the base of the leaf blade called ligule. Leaf blade long, narrow, venation parallel, exstipulate.

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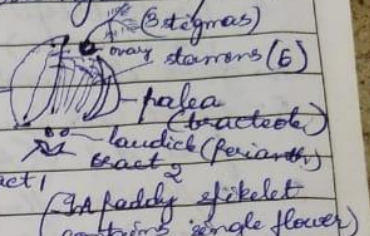
Inflorescence: It is a compound inflorescence. A unit of inflorescence is called spikelet. Spikelets (●) may be arranged in spike, panicle or raceme.

Each spikelet consists of one (paddy) lemma (bract 3) or few flowers (in wheat 3) and bears two empty bracts or glumes and the third bract is lemma which encloses the flower. Opposite to lemma there is somewhat smaller two nerved bracteole or glume called palea.



Flower: Bisexual, Bracteate, Bracteolate, hypogynous.

Perianth: It is represented by two minute scales at the base of the flower called lodicules.

Androecium: Stamens 6, free, in two trimerous whorls, anthers versatile.

Gynoecium: Tricarpellary but reduced to one by carpel fusion or by suppressing two. Style terminal or lateral.

Stigmas 3 feathery.

Fruit: caryopsis.

Remedial class questionnaire on Gamopetalae & Monocots.

1. Give diagnostic characters of family Rubiaceae.
2. Explain inflorescence in Asteraceae. (Mention it as head infl. & explain both homogamous and heterogamous head with ray & disc florets.
3. Write brief note on pollination in composite flowers. (Asteraceae)
4. Give diagnostic characters of the family Apocynaceae.
5. What do you mean by corollary corona? Where do you find it? (Apocynaceae & Asclepiadaceae)
6. Explain flower in Asclepiadaceae. (Explain the flower of Calotropis gigantea).
7. What is gynostegium?
8. Write short note on translator.
9. Explain pollination in Asclepiadaceae.
10. Explain corolla in convolvulaceae.
11. Give the diagnostic features of the family convolvulaceae.
12. Give the diagnostic features of the family Solanaceae with two examples.
13. Give the similarities between convolvulaceae & solanaceae
Ans: 1. Presence of persistant calyx.
2. presence of regular gamopetalous corolla
3. presence of five epipetalous stamens.
4. often false septum is formed in the ovary.
14. Write the differences between convolvulaceae & solanaceae.
Ans:

Convolvulaceae	Solanaceae.
① ovary is not obliquely placed.	① ovary is obliquely placed.
② There is definite number of (one or two) ovules in each locule of the ovary.	② ovules many.

15. What is meant by Jaculator?
16. Give the diagnostic features of the family Acanthaceae.
17. Give the diagnostic features of the family Verbenaceae.
18. Write any five diagnostic characters of the family Lamiaceae.
19. Explain inflorescence in family Euphorbiaceae. Give examples.
20. Explain fruits in family Moraceae

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21. Give the diagnostic characters of the family Amaranthaceae. Write any two examples.

22. Explain flower in Orchidaceae.

* For this first write about the flower → showy, bracteate, zygomorphic, bisexual, epigynous, trimerous and then explain Perianth, androecium, gynoecium separately.

23. What is meant by ensilination?

24. Explain column.

25. Explain flower in family Musaceae

26. Explain flower in the family Zingiberaceae.

27. Give the diagnostic features of the family Araceae

28. Explain inflorescence in the family Poaceae.

29. Explain leaves in Palmae

Ans) Leaves are of 2 types. 1. Palmately compound leaves
Ex) Borassus flagellifer

2. Pinnately compound leaves Ex) Cocos nucifera.

Palms having palmately compound leaves are called fan palms and palms having pinnately compound leaves are called feather palms. leaves are usually very large and long petioled, crowded only at the apex to form a dense crown, leaves are alternate, petiole is usually woody and clasping the stem at the base and sheathing in some genera, the falling leaves leave ring like scars on the stem or the leaf bases remain attached to the stem and the leaves break and fall off on drying due to their own weight

30. What is monocarpic palm?

Palms which dies after blooming once. Example Corypha umbraculifera (Talipot palm)

31. Polycarpic palms → live for many years and flowers every year

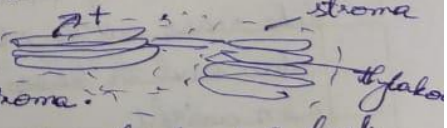
Teacher's Signature :

Remedial class questions (2) on Photosynthesis and Translocation.

1. Draw the structure of chloroplast and name the parts.
2. State and explain Blackman's law of limiting factors.
3. Explain cyclic and non-cyclic photophosphorylation.
4. Describe C_3 cycle.
5. Explain path of carbon in photosynthesis (Dark reaction)
6. Explain C_4 cycle / Hatch Slack pathway.
7. Differentiate between C_3 & C_4 plants. Give examples.
8. Explain Hills reaction.
9. Write brief note on red drop and Emerson's enhancement effect.
10. What is action spectrum.
11. Write note on absorption spectrum
12. Write short onote on chlorophyll pigments.
13. Differentiate photosystem I from photosystem II
14. Explain factors affecting photosynthesis.
15. Describe dark reaction of photosynthesis
16. Describe light reaction of photosynthesis.
17. Describe chemiosmosis during photosynthesis.

Chemiosmosis is the movement of ions across semipermeable membrane, down their electrochemical gradient. Example is generation of ATP by the movement of hydrogen ions across a membrane during cellular respiration & photosynthesis.

During cyclic and non-cyclic photophosphorylation, when photosystems get the energy and get excited, ions flow through ATP synthase from the thylakoid space into the stroma. This movement of ions is called chemiosmosis. These ions



move to form molecules of ATP in the stroma. ATPs are utilized in the formation of sugar molecules in the dark reaction of photosynthesis.

18. Explain girdling expt.
19. Explain Meench's hypothesis. Add a note on its merits & demerits.
20. Describe path and direction of translocation.

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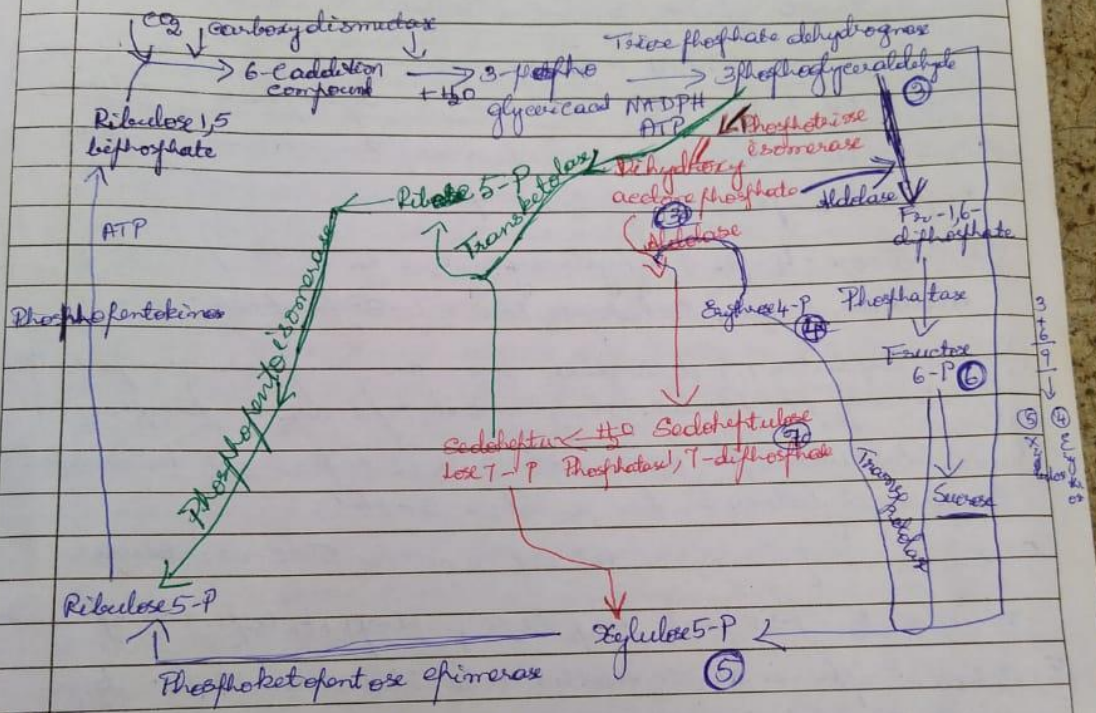
C_3 cycle / Dark reaction / CO_2 reduction / carbon pathway / calvin cycle of photosynthesis.



Various steps of calvin cycle:

1. The CO_2 is accepted by Ribulose 1,5 - diphosphate (RuDP) already present in the cells and a 6-carbon addition compound is formed which is unstable.

It soon gets converted into 2 molecules of 3-PGA.

Both these reactions takes place in the presence of Carboxydismutase or RUDP carboxylase.

3-PGA is the first stable product of dark reaction of photosynthesis.

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(2) 3PGA is reduced to 3PGAL by ATP & Triose phosphate dehydrogenase.

(3) Some of the molecules of 3PGAL isomerise into dihydroxyacetonephosphate. Both will unite in presence of aldolase to form fructose 1,6-diphosphate.

(4) Fr 1,6-diphosphate is converted into Fr-6-ph in the presence of phosphatase.

(5) Some of the F-6-ph is tapped off from the Calvin cycle and is converted into glucose, sucrose & starch.

Some of the 3PGAL molecules instead of forming hexose sugars are diverted to regenerate ribulose 1,5-diphosphate as follows.

(1) 3PGAL + Fr-6-ph in the presence of transketolase to form Erythrose 4-ph & Xylulose 5-ph.

(2) Erythrose-4-ph + dihydroxyacetone ph in the presence of aldolase to form Sedoheptulose 1,7-diphosphate.

(3) Sedoheptulose 1,7 diphosphate loses one phosphate group in the presence of phosphatase to form sedoheptulose 7-phosphate.

(4) Sedoheptulose 7ph reacts with 3PGAL in presence of transketolase to form xylulose 5-ph & ribose 5-ph.

(5) Xylulose-5-ph is converted into another 5-C atom sugar ribulose 5-phosphate in presence of phosphoketopentose epimerase enzyme.

(6) Ribose 5-ph is also converted into ribulose-5-ph. by enzyme Phosphopentose isomerase.

(7) Ribulose 5-ph is finally converted into ribulose 1,5-diphosphate in presence of phosphopentose kinase & ATP thus completing the Calvin cycle.

—x—

also on the leaves.

Uredospores appear in the months of Feb & march which represents the I stage of the disease these spots are formed inside the epidermis from the mycelium growing in the intercellular spaces of the host tissue. Spot or pustule is called as uredinium & uredosorus that consist of brownish red uredospores or urediniospores.

Uredospores develop singly at the ends of the hyphae called the sporophores. The sporophores arise in clusters from the mycelium below the epidermis. As soon as the uredospores mature, the urediria burst & the epidermis is split open exposing the underlying uredospores.

Struc. of Uredospore: Each uredospore is binucleate, broadly ovoid & with a thick wall consisting of 2 layers - the exosporium & the inner endosporium. Exosporium is brownish & has short spines, whereas endosporium is thin & colourless. On the outer wall, there are usually 4 germ pores or thin places. Spores are reddish brown in colour. Thus uredospores together appear rust

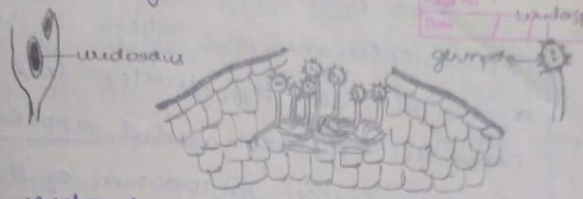
the germ of uredospores the mycelium produces a fresh crop of uredospores. In this way, a large area of the wheat crop may be infected. The uredospores thus serve for the vegetative propogation of the fungus.

Telial Stage:- This is characterized by the presence of spores called the teleutospores. It is in march or by the middle of April, when the crop is maturing & the weather is becoming unfavourable i.e hot & dry, another kind of spore is produced on the same stem or leaves of the host & the uredinial phase of the rust gradually changes into the telial phase.

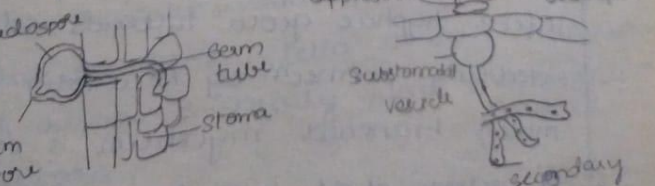
This phase is characterized by dark brown or black pustules, which are in the form of streaks called the telia. Telia contain numerous dark-brown or nearly black teliaspores or teleutospores.

The first teleutospores are generally dispersed in a mixed sorus containing uredospores as well. Sorus containing uredospores as

red. Hence, the name 'Rust' to this fungus.

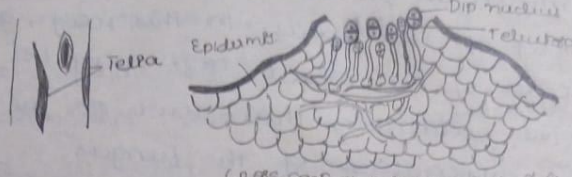


Uredospores mature during spring season & they get detached from the sporophores. Uredospores are scattered by wind or thro' insects. Uredospores are continuously produced for the whole month of march & thus spread the fungus from plant to plant & from field to field. Uredospores germinate readily in water & moist air. Uredospores, if they happen to fall on a wheat plant, they beg in to produce germ tubes thro' one or more germ pores.



Infection (Germination) of uredospore on the stem surface

well. Sori produced at the late stage contained only teliospores.



Cross sec. of teliospores of a wheat sori

Structure of teliospore :- Each teliospore is a 2-celled, spindle shaped, thick-walled spore. The c.w is exceptionally thick, consisting of stout outer coat of dark-brown colour & ~~germ~~ inner colourless layer.

The spore is made up of 2 cells. Cells are separated by a comparatively thin transverse septum where it shows slight constriction. Each teliospore is borne on long pedicel. Within the cytoplasm of each young cell are 2 nuclei which subsequently fuse into one. Each cells of the mature teliospore, ∴, contains a dip nucleus. Each cell has a germ pore. Teliospores are not capable of germ at once but represent the resting stage of the fungus. Teliospor

Germ tube grows over the surface of the epidermis & when it reaches a stoma, its tip develops into an elongated vesicle called appressorium. The binucleated protoplasm of the germ tube migrates into the appressorium & the empty germ tube gets separated by a cross wall from the appressorium. The appressorium forms a fine branch that penetrates into the stomatal opening & swells up in the stomatal chamber to form a sub stomatal vesicle. The entire content of the appressorium & the external hyphae passes into the substomatal vesicle & this gives rise to one or more infection hyphae. Infection hyphae grow towards adjacent cells & establish connection by haustoria. The much branched mycelium is composed of many short binucleate cells. By further branching, the mycelium spreads in the host. Within 6-10 days after

PUCCINIA

Div:- Mycota
Subdiv: Eumycotina
class: Basidiomycetes
order: Uredinales
Family: Pucciniaceae
Genus: Puccinia

Occurance:- Puccinia comprises about 700 sp & out of which 262 sps are reported from India. Fungus is parasitic. It causes 3 common rust on wheat namely, black rust by P graminis, Yellow rust by P glumarum & brown or orange leaf rust by P tritticina

P graminis affect cereals like wheat, oat, barley, rye as well as numerous wild grasses & produces the condn known as red rust or black rust.

Fungus is heteroecious rust & complete its life cycle on two hosts.

The first stage (dikaryotic stage) occurs on wheat rye, barley & many grasses while the second stage (monokaryotic stage) occurs on the leaves of the alternate host namely barberry plant.

leaves & sends out a germ tube, which penetrates the cuticle of the leaf. The germ tube dvps into a hypha consisting of 4 to 6 uninucleate cells. From each cell of this hypha, branches grow out & they dvp into a much branched mycelium. The mycelium spreads in the tissue of the leaf establishing haustoria in the cells.

The mycelium in barberry leaf is monokaryotic & carries either + or - strain according to the strain of the parent basidiospore. Sometimes both '+' & '-' mycelia will develop side by side in the leaf tissue. 4 days after infection, the mycelium gives 2 diff. kinds of structures. They are,

(1) Pycnia or Pycnidia or spermagonia on the upper side of the leaf.
(2) Aecidia or Aecia or cluster cups on the Ventral side of the leaf.

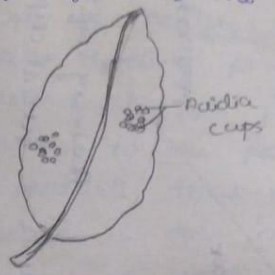
Structure of mycelium & Pycnia:- They are minute flask shaped or disc like receptacles which open by a narrow pore

at first completely encloses the aecidium but at maturity on account of formation of a large no. of aecidiospores, the overlying epidermis & the peridium get ruptured. The ruptured edges of the peridium are toothed & curve outwards, giving the appearance of cups.

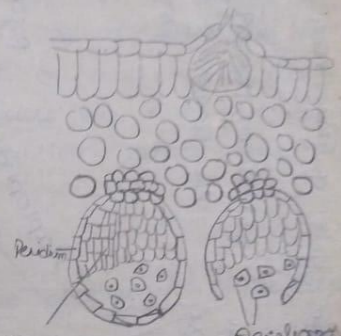
Struc of aecidiospore: The aecidiospores, become loose due to the disorganisation of the sterile intercalary cells bw them. Aecidiospores are polygonal in shape due to the mutual pressure before libration but become almost spherical on libration. spores have a thick wall which is provided with 6 germ pores. Aecidiospores are binucleate & are unable to infect bauberry they are blown away by wind & if they lodge on a suitable host (wheat pts), they germinate & the germ-tube enters the host thro' stoma.

Subsequent growth of the germ tube results in the formⁿ. of intracellular mycelium of dikaryotic cells in the host,

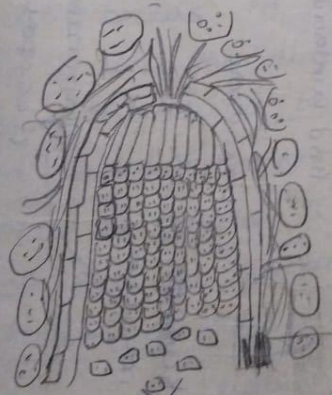
which give rise to uredosorus containing binucleate uredospores. Thus the life cycle of the parasite is completed.



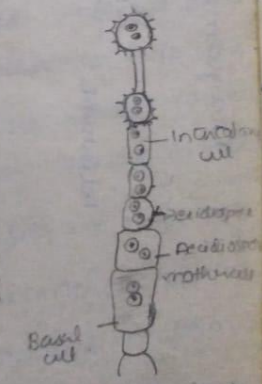
Infected bauberry leaf showing cluster of aecia on the ventral surface



Cross sect of leaf of a bauberry



Sect thro' a young



Chain of aecidiospores & intercalary cells

Mycelium:- In the dikaryotic phase of life cycle of the fungus, mycelium is composed of much branched septate hyphae. Each cell is dikaryotic & binucleate. mycelium contains many haustoria to get the food from the host.

In the monokaryotic phase of life cycle of the fungus, mycelium is composed of much branched septate hyphae. Each cell is monokaryotic & uninucleate.

Life cycle of P. graminis :- The life cycle of P. graminis is into 5 stages, which is based on the nature of the spores produced at the particular stage. The 5 imp stages are as follows :-

① Uredinial ② Telial stage ③ Basidial stage ④ Pycnial stage ⑤ Spermagonial stage ⑥ Aecial stage (Aecidial stage)

① Uredinial stage:- This is also known as rust stage. It is characterised by the presence of spores known as uredospores. Uredospores are produced on very prominent spots which appear on culms, on the leaf sheaths &

are mainly produced to carry the ③ pathogen over to the following seasons. ⑧

As teleutospores fall on the soil, they undergo a long rest period before they can germinate, they have to be exposed to the freezing temp of the winter.

Basidial stage:- This stage is characterized by the presence of basidiospores.

During the dormant stage of the teleutospores, 2 nuclei in each cell fuse. In the following spring, when the germination takes place each cell of the teleutospore puts out a short hypha through the germ pore. The fused nucleus from each cell of the teleutospore passes into the short hypha. In each short hypha, fused nucleus divides twice, during which meiosis occurs producing a row of 4 hap nuclei, which are then separated by transverse wall. This 4-celled structure is termed as the promycelium or epibasidium. From the side of each of the 4 cells, a short narrow tube or sterigma grows out, at the end of which a single basidiospore dvps. Hap nucleus now passes from each cell thro' the sterigma into

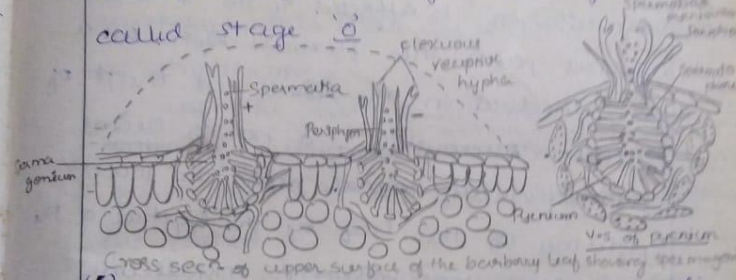
(13)

Insect is are subsequently brushed off by the flexuous hyphae & the perisphysis of the next spermagonium to which the insect visits If during this process, t spermatia are carried to the - flexuous hyphae of ~~the~~ another Spermatisation is affected & the spermatial nucleus passes into flexuous hypha by a pore dissolved in the ~~wall~~ wall at the pt of contact. Meanwhile, a no. of aecial primordia are formed near the lower epidermis of the leaf by the hyphae of the penetrating monokaryotic mycelium.

It is presumed that the spermatial nuclei passes down. Then flexuous hyphae finally reach the cells of aecial primordia making them binucleate. Spermatia & flexuous hyphae are the functional sex organs of Puc. The aecial primordia have been shown to abort if the spermatization fails to be accomplished.

Acc, to another view, the spermatisation is not essential for the dvpt of aecial

Structure of Pycniospore:- Pycniospore is uninucleate, minute body which (12) is produced in large nos. Some regard Pycniospore as functional male cells. For this reason, Spermagonial stage is also called stage ♂



Cross sec of upper surface of the barberry leaf showing spermagonia

(b) Aecial (Aecidial) stage:- Aecia, aecidium cups or cluster cups are produced on the ventral surface of the barberry leaf.

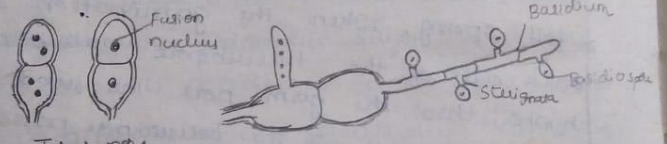
Just before the dvpt of an aecidium cup, fusion of spermatium & flexuous hypha is affected thro the agency of insects.

A fly a small insect get attracted by the smell of the spermagonial mass, visits it & sips the sweet nectar exuding from the ostioles. During this process, sperm tia ~~co~~ to the nectar adhere to the mouth parts, legs & wings. If the nectar

the developing spore As fungus is heterothallic the basidiospores are either of + or - strain

From each cell of the teliospore, 4 basidiospores are produced. Out of 4 basidiospores, 2 are of + strain & 2 are of - strain.

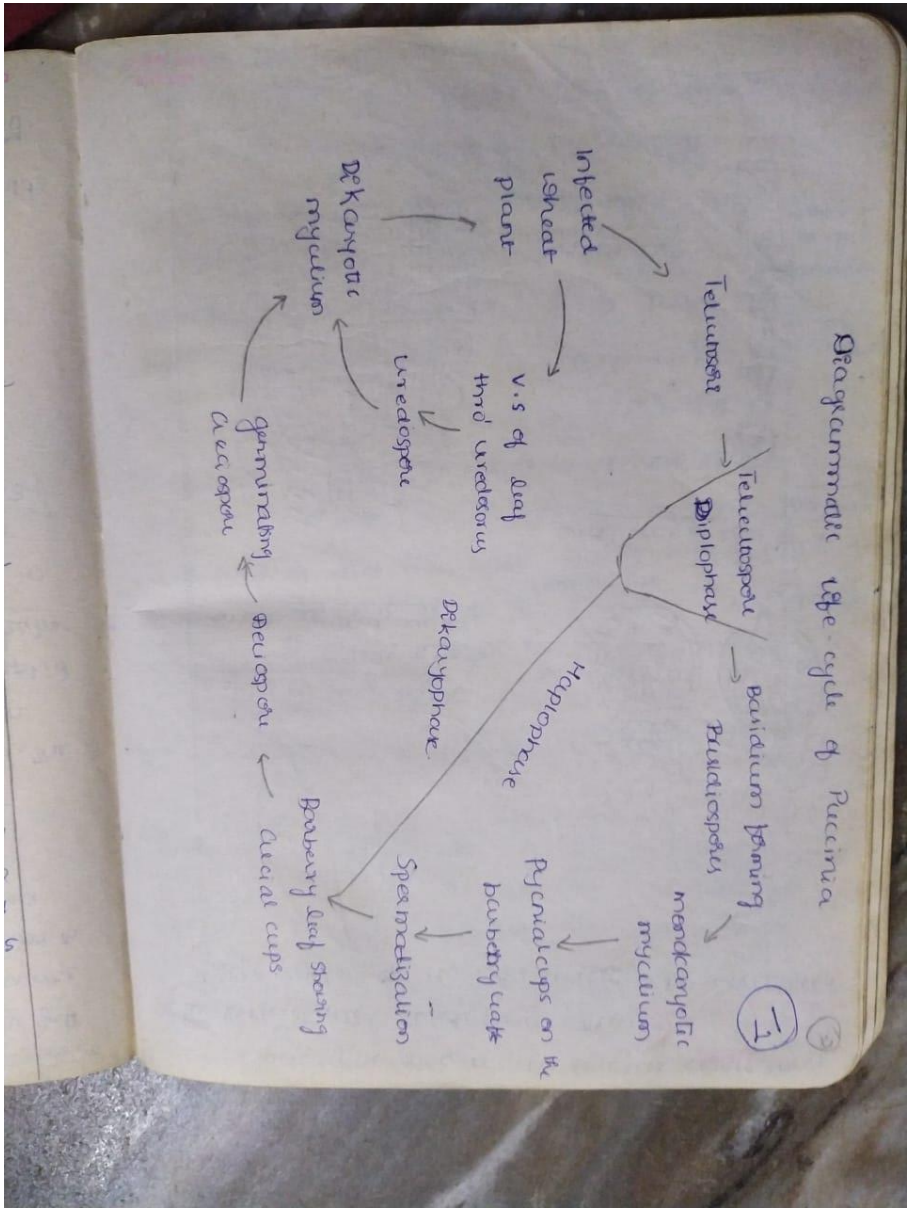
Basidiospores become detached from their stalks & are capable of direct germination. No host is required for the germination of the teliospores & for the formation of the basidiospores.



A germinated teliospore with a 4 celled basidium, each cell bearing one basidiospore

(4) Spermagonial or pycnial stage :- Basidiospores rest on the soil for one season & are unable to infect wheat. They cannot infect any other plant except the barberry [Berberis Vulgaris] which serves as an alternate host

In early spring, the basidiospores attack the barberry leaves. Spore germinates on the



Expt. No. Date

Page No.

VI Sem VIII Paper Practical Revision-2: 18/5/2020

1) A - Caesalfinia pulcherrima (caesalfinioideae)
B - Euphorbia hirta (Euphorbiaceae)
C - Hamelia patens (Rubiaceae) (Heliocid cyme) } Derivation & Description.

D - Hibiscus rosa-sinensis (Technical terms)

E - Apocyanaceae Allamanda cathartica

F Tea coffee powder G - Aloe H - rubber I - Sugar

2) A - Allamanda cathartica (Apocyanaceae)
B - Amaranthus viridis (Amaranthaceae)
C - Crotalaria (any species) Faboideae (if I get, I will send photo & confirm)

D - caesalfinia pulcherrima (caesalfinioideae)

E - calotropis gigantea (Asclepiadaceae)

F - coriander G - coffee powder H - garlic I - ragi

3) A - Hamelia patens / Ixora coccinea (Rubiaceae)
B - Euphorbia hirta (Euphorbiaceae)
C - Caesalfinia pulcherrima (caesalfinioideae)

D - Allamanda cathartica (Apocyanaceae)
E - Hibiscus rosa-sinensis (Malvaceae)
F - ginger G - cotton H - Cheer I - Bendelaga

Dear students, the above plants are available during the practical exams (June/July). So study them thoroughly. Keep herbarium carefully, wide folders.

Teacher's Signature :

Bryophytes

2 Marks each

1. Write any 4 salient features of bryophytes.
2. Write any 2 salient features of gametophytes of bryophytes.
3. Write any 2 salient features of sporophytes of bryophytes.
4. Name 3 classes in bryophytes with an example each.
5. Name the types of rhizoids in Riccia. How they differ?
6. What do you mean by amphigastria? Where do you find it?
7. Name the parts of sporophyte of Riccia.
8. What do you mean by inicubous arrangement? Where do you find it?
9. Give the position of antheridia in Porella.
10. What are elaters? Give their significance.
11. Give the significance of meristematic zone in Anthoceros sporophyte.
12. What is Columella? What does it consists of?

13. Write the function of columella.
14. What is protonema?
15. Name the parts in gametophore of Funaria.
16. Explain perigonium?
17. What is meant by moss flower?
18. Define peristome?
19. Define peristome? state its function.
20. State the theory of progressive sterilization.